TED (15) 1002A
(Revision - 2015)

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DIPLOMA EXAMINATION IN ENGINEERING/TECHNOLOGY/ MANAGEMENT/COMMERCIAL PRACTICE, NOVEMBER – 2020

ENGINEERING MATHEMATICS – I

[Maximum Marks: 75] [Time: 2.15 Hours]

PART-A

(Answer ***any three*** questions in one or two sentences. Each question carries 2 marks)

I. 1. Evaluate $3\sin \pi/6 - 4cos^3\pi/3$.

2. In $\Delta ABC, a = 5\ cm, b = 8\ cm, C = 60°$ find 'c'.

3. Prove that in $\Delta ABC, abc = 4R\Delta$.

4. Find $\frac{dy}{dx}$ if y = x^3 tanx.

5. Find the rate of change of area of a circle w.r.to its radius. (3 x 2 = 6)

PART-B

(Answer ***any four*** of the following questions. Each question carries ***6*** marks)

II 1. Find the value of tan15° without using tables and show that tan15° + cot 15° = 4.

2. Express $\sqrt{3}$cosx + sinx in the form Rsin (x + α) where 'α' is acute.

3. Prove that sin20° sin40° sin80° = $\frac{\sqrt{3}}{8}$.

4. Solve ΔABC *given* $a = 4\ cm, b = 5\ cm, c = 7\ cm.$

5. Differentiate 'sinx' by the method of first principles.

6. The displacement of a body is given by S = 3cos4t + 5sin4t. Show that acceleration varies as its displacement.

7. Find the maximum volume of a cone whose slant height is *'l' cm.* (4 x 6 = 24)

PART-C

(Answer ***any of the three units*** from the following. Each full question carries 15 marks)

UNIT – I

III (a) Prove that (cot A – 1)^2 + (cot A + 1)^2 = 2cosec^{2}A. (5)

(b) An aeroplane starts from a place and flies 1000m along a straight line at 45° to the horizontal. Find the horizontal distance described. (5)

(c) If sin A = - 4/5 and A lies in third quadrant, find all other trigonometric functions. (5)

OR

IV (a) If sin A = 8/17, sin B = 3/5, A, B are acute angles, find sin (A-B) and cos (A+B). (5)

(b) Prove that $\frac{cosecA}{cosecA-1}+\frac{cosecA}{cosecA+1}=2sec^2A.$ (5)

(b) Prove that $\frac{\cos(90+A)\sec(360+A)\tan(180-A)}{\sec(A-720)\sin(540+A)\cot(A-90)}=1.$ (5)

UNIT – II

V (a) Prove that $\frac{sinA+sin3A+sin5A}{cosA+cos3A+cos5A}$ = tan3A. (5)

(b) Show that a (b^2+c^2) cos A + b (c^2+a^2) cos B + c (a^2+b^2) cos C = 3abc. (5)

(c) Solve $\Delta ABC, given\ a=5\ cm, b=8\ cm, C=30°$. (5)

OR

VI (a) Prove that sin 33° + cos 63° = cos 3°. (5)

(b) Prove that cot A – cot 2A = cosec 2A. (5)

(c) Prove that 2 (bccosA + cacosB + abcosC) = $a^2+b^2+c^2$. (5)

UNIT- III

VII (a) Evaluate $\lim_{x\to 4}\frac{x^3-64}{x^2-16}$. (5)

(b) Find $\frac{dy}{dx}$, if x = a (Θ + sin Θ), y = a (1 – cos Θ). (5)

(c) If y = Acospx + Bsinpx (A,B,p are constant), show that $\frac{d^2y}{dx^2}$ is proportional to 'y'. (5)

OR

VIII (a) Find the derivative of tan x using quotient rule. (5)

(b) If $x^3+y^3=3axy$, find $\frac{dy}{dx}$. (5)

(c) If $y=x^2\sin x$, prove that $x^2y'' - 4xy' + (x^2+6)y = 0$. (5)

UNIT - IV

IX (a) A circular plate of radius 3 inches expands when heated at the rate of 2 inches/second. Find the rate at which area of the plate is increasing at the end of 3 seconds. (5)

(b) Find the equation of tangent and normal to the curve $y=3x^2+x+2$ at (1,2) (5)

(c) The deflection of a beam is given by $S=2x^3-9x^2+12x$. Find the maximum deflection. (5)

OR

X (a) If S denotes the displacement of a particle at time ‘t’ seconds and $S = t^3 - 6t^2 + 8t - 4$.
Find the time when the acceleration is 12 cm/sec^2. Find the velocity at that time. (5)

(b) An open box is to be made out of a square sheet of side 12cm by cutting of equal squares at each corner and turning up the sides. What size of the square sheet should be cut in order that the volume of the box may be maximum. (5)

(c) The perimeter of a rectangle is 100m. Find the sides when the area is maximum. (5)
